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PROCEEDINGS

First Annual Meeting

CENTRAL INTERNATIONAL FOREST  
INSECT AND DISEASE CONFERENCE

January 6 and 7, 1953  
Green Hall University Farm  
University of Minnesota

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January 6 and 7, 1953  
CENTRAL INTERNATIONAL FOREST INSECT AND DISEASE CONFERENCE

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## INTRODUCTION

For a number of years, entomologists and forest pathologists of the Central United States and Canada have felt the need for better integration of their thinking and activities. Preliminary discussions of a small representative group demonstrated that interest was sufficient to further explore the establishment of a forest insect and disease conference which might bring working entomologists and pathologists of the two countries together. Accordingly, a request was sent out to all potentially interested entomologists and forest pathologists that they be present on January 6th and 7th at University Farm in St. Paul, Minnesota to participate in an organizational meeting and to contribute to a general discussion of mutual problems and progress. Response to the request for participation was remarkable. Representation was obtained from all of the agencies in the United States and Canada who are concerned with forest protection, as well as all of the major universities in both countries that serve the central international area. The undertaking was given substantial impetus by the presence and encouragement of Dr. J. A. Beal, Chief, Division of Forest Insect Investigation, USDA; Dr. J. R. Hansbrough, Senior Pathologist in Charge, Division of Forest Pathology, USDA (New Haven Laboratories); Dr. M. L. Prebble, Chief, Division of Forest Biology, Department of Agriculture, Ottawa; and Dr. J. E. Bier, Associate Chief, Division of Forest Biology. The opportunity to meet jointly proved so profitable for both entomologists and pathologists that it was unanimously agreed to hold future meetings which would continue to stress, informally, common insect and disease problems and the research approaches of the various workers who must cope with them. An opportunity was given each representative to outline the work in progress under his supervision or direction, and also to present some information on the progress of the particular project to which he had reference. Future programs may not follow this same pattern exactly; however, it was considered highly desirable that the informal aspect of the program should be preserved and that as much time as possible should be made available for informal interchange of ideas and information.

Dr. Blair M. McGugan, Division of Forest Biology, Science Service, Canadian Department of Agriculture, Forest Insect Laboratory, Sault Ste. Marie, Ontario, Canada, was chosen chairman of the group for the ensuing year. An abbreviated statement of objectives was adopted in lieu of a formal constitution, confining responsibility for their perpetuation in a chairman to be elected at the close of each annual meeting. It is the chairman's responsibility to prepare the ensuing program, to make arrangements for the annual meeting, and to discharge such additional responsibilities as the organization may assume. It was agreed that the next annual meeting will be held at the Laboratory of Forest Biology, Sault Ste. Marie, Ontario, Canada, in October, 1953.

The transcript of the proceedings of the January 6th and 7th conference has been reviewed by the respective participants. Such inaccuracies as still exist must be attributed to the undersigned, who has considered it his responsibility to achieve as much uniformity as possible in the presentation of this material.

J. W. Butcher  
Acting Chairman  
Pioneer Meeting  
Central International  
Forest Insect and Disease  
Conference

SCHEDULE OF EVENTS FOR 1953 MEETINGS OF THE CENTRAL INTER-  
NATIONAL FOREST INSECT AND DISEASE WORK CONFERENCE

Plant Pathology Building  
University Farm St. Paul 1, Minn.

January 6

- 9:00 to 12:00 Business Meeting for Consideration and Adoption of  
Constitution.
- 12:00 to 1:00 Luncheon at University Farm Cafeteria.
- 1:00 to 2:00 Forest Insect and Disease Research and Survey Activities in  
United States and Canada.  
(J. A. Beal, J. R. Hansbrough, J. E. Bier, M. L. Prebble.)

Discussion of Research and Current Problems

(Listed heads and moderators are urged to encourage contributions from  
their staffs and associates during the time assigned to their organization  
or state.)

- 2:00 to 2:45 Sault Ste. Marie Laboratory of Forest Biology - R. M. Belyea  
and Staff.
- 2:45 to 3:45 Milwaukee Forest Insect Laboratory - H. J. MacAloney and Staff.
- 7:30 Smoker.

January 7

- 9:00 to 9:45 Saskatoon Forest Pathology Laboratory - C. J. Riley and Staff.
- 9:45 to 10:30 State of Michigan - Moderators: F. G. Strong, Pathologist  
S. A. Graham, Entomologist  
L. M. Argetsinger, Pathologist
- 10:30 to 11:15 Winnipeg Laboratory of Forest Biology - R. R. Lejeune and  
Staff.
- 11:15 to 12:00 State of Minnesota - Moderators: D. W. French, Pathologist  
A. C. Hodson, Entomologist  
R. L. Anderson, Pathologist
- 12:00 to 1:00 Luncheon at University Farm Cafeteria.
- 1:00 to 1:45 Indian Head Laboratory of Forest Biology - L. O. T. Peterson  
and Staff.
- 1:45 to 2:30 State of Wisconsin - Moderators: J. E. Kuntz, Pathologist  
R. D. Shenefelt, Entomologist
- 2:30 to 3:15 University of Toronto - Moderators: L. T. White, Pathologist  
C. E. Atwood, Entomologist
- 3:15 to 5:00 Informal Discussion.

FOREST INSECT AND DISEASE RESEARCH AND SURVEY ACTIVITIES IN THE UNITED STATES  
AND CANADA

Division of Forest Insect Investigations - United States of America

J. A. Beal

There are approximately twelve Division of Forest Insect Investigations field laboratories in the United States, Alaska, and the Panama Canal Zone. They are obliged to work on direct control measures for forest insects, to a great extent, but we would like to emphasize more and more natural or biological control studies; particularly from the long-range viewpoint. We are also definitely interested in tree breeding programs. Originally, the primary objective was the production of better boles. Several varieties resistant to forest insects and diseases are showing up, however, and these have not only stimulated tremendous interest on the part of tree breeders but have reshaped their objectives. We are confronted with more problems in the control of forest insects than we have ever encountered before. Our losses appear to be at an all time high both volume-wise and dollar-wise. With these losses have come greater interest in and greater public demand for the intensification of our efforts in pest control and in research designed to improve the present known control methods.

We have a number of situations where we have joint Canadian-American problems; for example, airplane spraying projects, exchanging samples of insects and diseases, and cooperation in work on virus diseases of forest insects, just to mention a few. There are, in addition, a great many other projects on which we cooperate with Canadian entomologists. In addition, we have a great many cooperative projects with private industry, as well as with the several states. Our progress would be severely retarded were it not for this excellent cooperation.

As regards the structure of our organization, we have two men in the division office, in addition to myself; Messrs. Baker (in charge of research) and Parker (in charge of surveys). We have field stations at Portland, Oregon, with substations in Alaska; Berkeley, California; Coeur d'Alene, Idaho; Ogden, Utah; Fort Collins, Colorado; and a new one at Albuquerque, New Mexico. We also have laboratories at Milwaukee, Wisconsin and Columbus, Ohio, with substations at Columbia, Missouri and Moorestown, New Jersey; New Haven, Connecticut; Beltsville, Maryland; Asheville, North Carolina; and Gulfport, Mississippi. The latter have substations in Texas, Florida and the Panama Canal Zone.

The Gulfport Laboratory has been doing considerable work on forest products insects and in research connected with log and lumber storage. In the Southeast, we have had three sizeable outbreaks of sawfly species that are as yet unnamed, and a great deal of trouble with pine beetles. These are receiving some attention in both surveys and research studies. The laboratory at Beltsville, Md., is primarily concerned with spruce budworm, with special emphasis on aerial spraying formulation. Many of the Lake States' problems are concerned with plantations

and the insects associated therewith. The Columbus, Ohio, station is working on vectors of plant disease and works very closely with the Division of Forest Pathology. These joint projects are associated with elm phloem necrosis, Dutch elm disease, and oak wilt. Principal projects of the New Haven station are spruce budworm, both biological and direct control studies; the white pine weevil; scale insects; and development of sprays and spraying equipment. The Colorado station at Fort Collins is primarily concerned with bark beetle problems and with defoliators, to a lesser extent. The Coeur d'Alene, Idaho, station has been doing work on survey and control of the mountain pine beetle and Englemann spruce beetle, as well as with budworm and other defoliators. The station at Ogden, Utah, is exclusively a survey station, as is the case with the one at Albuquerque, New Mexico. The one in Portland, Oregon, carries on a considerable amount of research on spruce budworm, the Douglas fir beetle, and the susceptibility of Ponderosa Pine to bark beetle attack, etc. They have also been doing a considerable amount of work on defoliator problems. At the California station, the main problems under study are related to bark beetles.

I shall leave to Dr. MacAloney the details on projects of the Milwaukee station. Our over-all program encompasses survey and research. We have been called on to assist in control programs to a very great extent. This, naturally, cuts down on the research time available to our staff. We should like very much to increase the scope of our research activities, particularly in the more basic subjects.

Division of Forest Pathology - United States of America

J. R. Hansbrough

I could almost repeat Dr. Beal's remarks, substituting "forest pathology" for "forest entomology". Forest disease problems are similar throughout forest types, hence the problems in the Lake States area where the spruce-fir and northern hardwood types predominate are closely related to those of northeastern United States where the same types occur. This is the basis for directing research in this region from the New Haven, Connecticut, laboratory.

As a Division, we are not engaged in survey activities to the same degree that the Division of Forest Insect Investigations is. Forest diseases do not fluctuate in cycles as do forest insects, hence, there is less need for over-all annual surveys. We do, however, conduct surveys for specific diseases that are already epidemic or threaten to become so, such as pole blight of western white pine, oak wilt, and birch dieback. Generally speaking, a higher percentage of our funds go into research than is true at present in Forest Insects.

In response to Dr. Kuntz' question as to the structure of the Division of Forest Pathology, I briefly summarized it as follows: Our headquarters office is at the Plant Industry Station, Beltsville, Maryland, a suburb of Washington, D. C. The United States is divided into four large geographic areas for

administrative and research supervision, as an aid in coordinating research in similar forest types. These areas are (1) the Northeastern and Lake States where the principal forest types are northern hardwoods, spruce-fir, northern pines, and transition hardwoods, (2) the Southeastern and Southern States where the principal forest types are the southern pines and the southern hardwoods, (3) the Great Plains and the Rocky Mountain States where the western yellow pine, lodgepole pine, and western white pine types predominate, and (4) the West Coast States where the Douglas fir, sugar pine, and western fir types predominate. In each of these regions there are from two to four substations working on specific problems and cooperating closely with other agencies interested in the same problems. The Division has a staff of approximately fifty professional forest pathologists, with additional personnel in sub-professional and clerical capacities. We have not been particularly active in the Lake States, having only one permanent man, Ralph L. Anderson, stationed here at present. Our long term plans envision a great expansion of our activities in this region.

The Division of Forest Pathology conducts research on both the endemic and epidemic diseases causing serious forest losses. They may be roughly classified into three groups; (1) native diseases, (2) introduced diseases, and (3) products pathology. In all our laboratories the study of heart rots of forest trees is one of primary importance. On white pine blister rust, we are cooperating in the work of selecting and breeding for resistance and investigating the question of whether more than one strain or race of the blister rust fungus is present in this country. On chestnut blight we are continuing our selection and breeding work in search of a chestnut tree that has the desirable characteristics of our American chestnut, plus the blight resistance of the Chinese chestnut. On the Dutch elm disease and phloem necrosis we have a special laboratory at Columbus, Ohio, working entirely on the problem of securing elms resistant to both diseases. On oak wilt we not only collaborate with several states on research problems but also maintain a special laboratory at Columbia, Missouri, working on control methods and in cooperation with the Division of Forest Insect Investigations, on the vector situation. Pole blight of western white pine is one of our major problems and this disease and oak wilt have been the subject of almost all of our forest disease survey activities. Research continues also on the cause and control of the little leaf disease of shortleaf pine in the Southeast and birch dieback in the Northeast. Birch die-back has been the subject of several international conferences and indicates how closely Canadian and United States research agencies can cooperate on forest pest problems to their mutual advantage. On products pathology, the Division's activities are centered at the Forest Products Laboratory at Madison, Wisconsin, with most of the field laboratories cooperating on certain problems. This very briefly suggests the nature and scope of our activities.

Division of Forest Pathology in Canada

J. E. Bier

The forest pathologists in Canada form part of the Division of Forest Biology, Science Service, Federal Department of Agriculture. At present there are six branch laboratories in forest pathology in Canada. These are located at Fredericton, New Brunswick; Quebec, Province Quebec; Toronto, Ontario; Saskatoon, Saskatchewan; Calgary, Alberta; and Victoria, British Columbia. It is possible that a staff in pathology will be located at the Laboratory of Forest Biology, Winnipeg, Manitoba, within the next year or two. It is mentioned that all branch laboratories in forest pathology have become established over a period of the last twelve years. The total staff amounts to seventy-eight persons of which forty-two are professional personnel. Matters of policy, demonstration, research direction, project coordination, etc., are dealt with at the headquarters for the Division of Forest Biology, Ottawa, Ontario.

Research on timber or products pathology is conducted by the Department of Resources and Development in Canada. The work is located at two centres: The Forest Products Laboratory, Ottawa, Ontario; and The Forest Products Laboratory, Vancouver, British Columbia.

None of the Provincial Governments or industry in Canada have engaged forest pathologists on their staffs. However, it is important to mention that both the above interests are sending technical personnel to pathological laboratories for research direction and work. This has resulted in a high degree of cooperation and coordination between the forest research undertaken by forest pathologists and Provincial and company foresters. At present the Provincial Government in Ontario is constructing an excellent laboratory at Maple to accommodate members of the Toronto establishment.

Since the organization of the Division of Forest Biology in 1951 the forest biology rangers (previously called forest insect rangers) have become organized for a nation wide disease, as well as insect, survey. The forest pathologists are very fortunate to have the services of this large group of non-professional workers in addition to the technicians assigned to each laboratory. It has been demonstrated that with experience the above types of personnel are competent to undertake the standardized procedures on project work. This provides the scientist with more time to devote to the research aspects of a problem.

A review of the pathological projects of national importance in Canada emphasizes the need for a greater coordination in forest research. It is concluded that this principle applies equally to other specialized groups. The more recent development of educational standards requiring high specialization for qualification in one of the many disciplines of forest research has been a sound and logical advance. Unfortunately on occasion a specialist in one field has assumed the responsibility for the solution of research problems of a most complex nature. Possibly this has occurred to some degree in such problems as birch



die-back in the Maritimes, needle blight of white pine in Ontario, Hypoxylon canker of poplar in the Prairie Provinces, and pole blight of white pine in British Columbia. The addition of research in tree physiology, anatomy, ecology, soils, microclimatology, mycorrhiza, etc., has been of essential importance to pathologists and entomologists in an effort to solve the complex problem of birch die-back. One wonders what the outcome of a bioclimatological approach to the insects causing wounds in poplar and their relation to the incidence of Hypoxylon canker might be. The Division of Forest Biology has recognized this need for a coordinated approach to research problems and has recruited specialists in anatomy, ecology, physiology, genetics, mycorrhiza, etc., whose research is essential to a solution of the problems in pathology and entomology. The present Central International Forest Insect and Disease Work Conference brings together entomologists and pathologists to discuss joint problems. There is no question that in the planning, progress and solution of many of our problems it will be necessary to consult with and engage specialists in other disciplines of forest research.

#### Division of Forest Biology in Canada

##### M. L. Prebble

The Division of Forest Biology, one of seven divisions of Science Service of the Department of Agriculture, Canada, has headquarters in Ottawa with regional laboratories as follows:

<u>Maritime Provinces.</u>	Regional laboratory at Fredericton, New Brunswick, with sub-laboratories at Debert, Nova Scotia, and at Corner Brook, Newfoundland.
<u>Quebec.</u>	Regional laboratory at Quebec City, Quebec.
<u>Ontario.</u>	Laboratory of Forest Pathology at Toronto, Ontario. Forest Insect Laboratory at Sault Ste. Marie, Ontario. Laboratory of Insect Pathology at Sault Ste. Marie, Ontario.
<u>Manitoba.</u>	Forest Insect Laboratory at Winnipeg, Manitoba.
<u>Saskatchewan.</u>	Laboratory of Forest Pathology at Saskatoon, Saskatchewan, and Forest Insect Laboratory at Indian Head, Saskatchewan. (responsible for the southern agricultural portions of the three Prairie Provinces.)
<u>Alberta.</u>	Forest Insect Laboratory and Laboratory of Forest Pathology at Calgary, Alberta.
<u>British Columbia.</u>	Forest Insect Laboratory at Vernon, British Columbia. Forest Insect Laboratory and Laboratory of Forest Pathology at Victoria, British Columbia.

The Division of Forest Biology has a total staff of approximately 390 persons employed throughout Canada and assisted by a variable number of casual employees during the summer months. About 150 of this number are trained in entomology and pathology; about 80 are trained as rangers or field assistants in Survey and Investigational programs; about 55 are trained as laboratory technicians.

The policy of the Division of Forest Biology is to carry out the Forest Insect and Disease Survey and to investigate insect and disease problems throughout Canada. The Forest Insect Survey was set in operation about 16 years ago and has been functioning from coast to coast. In addition to being a detection service, the Forest Insect Survey is regarded as the complement of the research investigations. Objectives and techniques are continually being crystallized and improved. Since 1951, tree diseases have been included in the Survey to form a combined Forest Insect and Disease Survey. Special staff is attached to each laboratory to look after Survey problems. The field organization depends on the Forest Biology Rangers and 88 districts have been defined throughout Canada, each of which will be the specific responsibility of one Forest Biology Ranger.

In the program of research of the Division of Forest Biology each scientific member of the staff has a specific responsibility for one or more research projects and, so far as possible, is protected from distracting influences that would interfere with the prosecution of research. Each project leader is required to keep in touch with provincial authorities carrying out research in similar fields and from time to time is required to devote a small proportion of his time to such professional and extension activities as may be required to bridge the gap between research, which is a function of the Division of Forest Biology, and application, which is the prerogative of provincial departments and industrial organizations.

In addition to the regional laboratories referred to earlier, there are various sections within the Division of Forest Biology which play an important part in its research program. They include a section of genetics and cytology; a section of bioclimatology; a section of insect pathology and a section of chemical control. Section leaders are required to keep in touch with all regional laboratories in reference to research programs closely related to sectional interests. At the present time, three of the four sections noted above are headquartered at the laboratories in Sault Ste. Marie, Ontario, Canada.

DISCUSSION OF RESEARCH AND CURRENT PROBLEMS IN LABORATORIES THROUGHOUT THE CENTRAL INTERNATIONAL AREA

Sault Ste. Marie Laboratory of Forest Biology

R. M. Belyea

At Sault Ste. Marie, Ontario, are located two laboratories of the Division of Forest Biology; the Laboratory of Insect Pathology, which is concerned with investigations of insect diseases (primarily fundamental studies), and the Forest Insect Laboratory, which is concerned with the broader aspects of forest entomology in the Province of Ontario. While these two laboratories have separate Officers-in-Charge (J. M. Cameron, Officer-in-Charge, Laboratory of Insect Pathology; R. M. Belyea, Officer-in-Charge, Forest Insect Laboratory), they operate under a joint administration and co-operate most closely in the execution of their investigative programs.

Attached to the Forest Insect Laboratory are four Field Stations in which field investigations are centred during the summer season - the Laniel and Chalk River Field Stations in the east, the Black Sturgeon Lake Field Station north of Lake Superior, and Cedar Lake Field Station in the northwest.

The staff of the Laboratories consists of the following:

	<u>Permanent staff</u>			<u>Seasonal Staff</u>
	<u>Technical Personnel</u>	<u>Forest Biology Rangers</u>	<u>Non-Technical Personnel</u>	
Forest Insect Laboratory	30	22	22	30-32
Laboratory of Insect Pathology	<u>10</u>	—	<u>23</u>	<u>7-9</u>
	40	22	45	37-41

The following is a listing of the more important current studies being conducted at the Forest Insect Laboratory and its subsidiary Field Stations. In each case, the name of the project leader is indicated.

1. Forest Insect Survey (Ontario) - W. L. Sippell, Officer-in-Charge, Forest Insect Survey.
  - J. E. MacDonald, Chief, Forest Biology Ranger.
- (a) Ecological studies of the forest tent caterpillar in Ontario with special reference to insect parasites and diseases - W. L. Sippell.
- (b) Studies of stand development and species composition of the Boreal Forest in northern Ontario - H. D. Haswell.
- (c) Studies on the larch sawfly in Ontario - D. R. Wallace.

2. Section of Bioclimatology - W. G. Wellington, Section Head.
  - (a) Investigations in ecological meteorology with special reference to the ecology of forest insects: General studies - W. G. Wellington.
  - (b) Phenological investigations of forest insects and their host trees - A. H. Rose.
  - (c) Investigations of the behaviour and physical ecology of the white pine weevil - C. R. Sullivan.
  - (d) Investigations of the behaviour and physical ecology of Neodiprion sawflies - G. W. Green.
3. Section of Cytology and Genetics - S. G. Smith, Section Head.
  - (a) Cytological survey of the order Coleoptera - S. G. Smith and Miss D. E. Maxwell.
  - (b) Investigations of the sex ratio in the spruce budworm Choristoneura fumiferana (Clem.)
  - (c) Investigations of the rate of yolk consumption by overwintering larvae of the spruce budworm Choristoneura fumiferana - S. G. Smith.
4. Studies of physiology of insects - G. T. Harvey.
  - (a) Studies of the metabolism of the spruce budworm.
  - (b) Determination of incubation threshold of eggs of Choristoneura spp.
5. Investigations of the flowering history of balsam fir in relation to development of spruce budworm outbreaks - W. E. Cawthray, R. M. Belyea.
6. Ecological relationships of poplar and balsam with reference to outbreaks of the forest tent caterpillar and the spruce budworm, A. W. Ghent, J. R. Rooke.
7. Investigations of populations, and natural control of the spruce budworm in northwestern Ontario - J. R. Blais, S. McDonald.
8. Ecological studies on the spruce budworm - J. R. Blais.
9. Regeneration studies in forest stands devastated by the spruce budworm in Ontario - M. L. Prebble, D. A. Fraser, J. R. Rooke, J. B. Thomas, A. W. Ghent.

10. Investigations of pathogens of the spruce budworm, Port Arthur district of Ontario - H. M. Thomson.
11. Investigations of pathogens of the larch sawfly Pristiphora erichsonii - A. M. Heimpel.
12. Investigations of insects affecting seed production in red pine - L. A. Lyons.
13. Investigations of the mortality of white spruce in the Lake Nipigon area - J. B. Thomas.
14. Investigations of borer damage in fire-killed pine, Mississagi fire area - L. M. Gardiner.
15. Ecological studies in a hardwood stand at Chalk River, Ontario, with special reference to the condition of yellow birch - D. A. Fraser.

#### Milwaukee Forest Insect Laboratory USDA

##### H. J. MacAloney

The forest insect laboratory at Milwaukee has been in operation about 18 years. Our territory covers all of Forest Service Region Nine, which includes the Central States as well as the Lake States. We are responsible for research and survey work on forest insect infestations on nationally owned lands in this entire territory and we give assistance wherever possible to State and private agencies. Because of a small station staff we have confined most of the research work to the Lake States and at the present time our active projects relate to the Saratoga spittlebug, the larch sawfly, the white-pine weevil, and the jack-pine budworm. We are also carrying on a spraying experiment in cooperation with the Illinois Natural History Survey and the Forestry Division in the use of a virus disease as a control for the European pine sawfly in red pine plantations in that State. An appreciable amount of time is spent by all of us on survey work, particularly on the National Forests and Indian Lands but also in cooperation with State Entomology and Forestry Departments. Dr. Benjamin and Mr. Drooz will discuss their research problems in more detail.

##### D. M. Benjamin

One of the major forest insect problems in the Lake States during the past decade has been the Saratoga spittlebug. Since 1946, it has been necessary to treat approximately 31,000 acres of red and jack pine plantations to control this insect. The Saratoga spittlebug is quite unique in that, although it is distributed from Florida north to Ontario, damaging populations have built up only in certain portions of the Lake States. The adults feed on red and jack pine and the nymphs on a number of species of woody and herbaceous plants growing on the forest floor. The most important of these alternate hosts are sweet fern and several species of Rubus. Ecological investigations have been directed toward

the survey and control aspects of the problem. Recent studies have established correlations between nymphal and adult population densities and between adult population densities and resulting feeding injury. Significant changes in tree form attributable to Saratoga spittlebug feeding have been demonstrated. These changes may be detected prior to flagging or at the sub-economic injury level.

Question

Have you ever found Saratoga spittlebug injury in jack pine 60 to 80 years of age?

Answer

We have not encountered flagging injury on trees in that age bracket.

Question

What technique was employed when spittlebug nymphal populations were compared with adult populations?

Answer

The actual number of nymphs feeding on sweet fern (on 10 milacre plots) was compared with the number of adult bugs swept from 20 trees within the same tenth-acre study area. Further refinements should include classification by sweet fern to pine ratios.

A. T. Drooz

Most of the work with which I am concerned deals with the larch sawfly in Minnesota. Research phases are concerned with interpreting population dynamics of the larch sawfly. We have used frass sampling techniques in much of our population analysis work and we are also using branch samples. We also use the technique of aerial examination or survey, following flight lines previously laid out 12 miles apart. We have cooperated with the Belleville Laboratory in the release of parasites, but we have run into host resistance to the parasite the same as was found in Canada. For the present, we are discontinuing further liberations of parasites against the larch sawfly.

Question

What about the small mammal populations in your work areas?

Answer

We have not made any quantitative measurements, but we do intend to make some spring collections to develop information regarding the gross overwintering mortality picture.

H. J. MacAloney

Dr. Benjamin has been doing additional work in cooperation with the State of Michigan on the white-pine weevil. We will make every effort to keep Dr. Benjamin and Mr. Drooz on their research work in the critical part of their seasonal period. Mr. Beckwith and I will be available for whatever survey work will be necessary during that time.

Active Projects

Studies of the biology of the pine sawflies and the effects of environment on their abundance (D. M. Benjamin and A. T. Drooz).

Studies of biotic agents as a means of controlling pine sawflies (D. M. Benjamin and A. T. Drooz).

Studies of the biology of the larch sawfly and the effects of environment on its abundance (A. T. Drooz).

Studies of biotic agents as a means of controlling the larch sawfly (A. T. Drooz and D. M. Benjamin).

Studies of biotic agents as a means of controlling the jack-pine budworm (D. M. Benjamin and A. T. Drooz).

Studies of the biology of the Saratoga spittlebug and the effects of environment on its abundance (D. M. Benjamin).

Studies of the control of the white pine weevil through the application of insecticides (D. M. Benjamin).

Development of methods for conducting the most effective and economical forest insect surveys (H. J. MacAloney, D. M. Benjamin, A. T. Drooz, L. C. Beckwith).

Laboratory of Forest Pathology, Saskatoon, SaskatchewanC. J. Riley

The Laboratory of Forest Pathology at Saskatoon is responsible for work in Saskatchewan and Manitoba. The principal forest types in this region are indicated on the map which accompanies Halliday's "Forest Classification for Canada" (Bulletin 89, Forest Service, Canadian Department of Mines and Resources, 1937). In the Mixedwood Forest Section which occupies a zone north of the prairie and agricultural area, the principal species are white spruce, jack pine, aspen, black spruce, and tamarack. North of the Mixedwood lies the Northern Coniferous forest of the Pre-Cambrian Shield, in which black spruce, tamarack, jack pine and aspen predominate. Balsam fir is not an important species in most of this region, but it is increasing in abundance, and probably will occupy an important place in future stands.

The principal projects being conducted at the Saskatoon Laboratory include decay studies in white spruce and aspen, root diseases of spruce, mistletoe of jack pine, diseases of nurseries and plantations, and the forest disease survey. The actual volume of decay in the white spruce stands is not great. Butt rots which enter through the roots are responsible for considerable loss through wind

breakage. Root diseases are believed to be responsible for mortality of single and groups of trees in all age classes. These are being investigated by a research team which includes a pathologist, an ecologist, and an entomologist. Good evidence has been found of relationships between soil conditions, injury caused by a root wounding insect, and root-rot fungi.

Jack pine mistletoe (Arceuthobium americanum) is widely distributed in the Mixedwood Forest Section, but has not been reported east of Manitoba. A survey is being conducted to establish the eastern extremities of the range of mistletoe and to determine whether or not the parasite is spreading eastward. Other aspects of the disease are also being studied, including the ascomycetous parasite of mistletoe, Wallrothiella arceuthobii. This fungus is common and may be a more important agent in the natural control of mistletoe than has been realized. I should be grateful to be advised regarding any occurrence of jack pine mistletoe east of Manitoba.

Our forest disease survey is yet in its infancy. No personnel are assigned wholly to this project. Field data are collected by people engaged primarily in other kinds of work. Forest Biology Rangers whose primary duties are entomological are being trained in disease survey work. Survey data are collected in conjunction with all field work in other projects. Personnel employed in Provincial and Federal Forest Services, and in private employment, contribute many reports and samples. The annual report of the Forest Disease Survey is now published jointly with that of the Forest Insect Survey.

We have recently added to our staff a specialist in forest nursery diseases. His responsibilities will involve not only diseases that occur in nurseries, but also those of plantations, including shade trees and windbreaks. In this field, diseases with physiological relationships are perhaps more common and important than in other regions, owing to the naturally unfavourable conditions for tree growth in prairie regions. Extremes of cold, drought, and soil conditions may predispose planted trees to attack by weak parasites that are usually unimportant in vigorous trees.

State of Michigan, Michigan State College

F. C. Strong

Forest and Shade Tree research work carried on at Michigan State College covers the following investigations and duties:

Control of damping-off of conifer seedlings in forest tree nurseries using various chemical fungicides. These fungicides are applied in three ways: (1) Dusting of the seeds immediately before sowing; (2) Sprinkling on the fungicides after seed is sowed, with subsequent sprinklings at several day intervals; and (3) Mixing the fungicides into the soil prior to sowing of the seed. A second published report is planned for this summer.



Cedar-apple (and hawthorn) rust control in ornamentals has been studied for several years. Suppression of spore production of galls on red cedars is the primary purpose of this work. Elgetol (Na-dinitrocresylate) prevented spore production but proved injurious to red cedar foliage in some cases. Keitt's Bordeaux 180 formula has given excellent suppression of spore production on red cedars but the two arsenite compounds in this formula are not easily obtained. Other fungicides are being tested.

Hypoxyton canker experimental studies are in progress.

Shade tree leaf disease control studies especially on elm leaf spot and hawthorn leaf blight (black spot) are also being carried on.

Dutch elm disease control work in Michigan has brought about the establishment of an Identification Laboratory which is financed and operated cooperatively by the State Department of Agriculture and the Michigan State College. Over 800 samples were handled with about 200 positive Dutch elm diseased trees being found.

Oak wilt disease identification work is also carried on in this same laboratory. Mr. Norman Smith will give you more information on surveys and on control work in Michigan.

#### University of Michigan

##### S. A. Graham

My interest over a period of years has been concerned chiefly with the silvicultural aspects of forest insect control. There are certain forest types in which no significant damage from insects has occurred over a period of at least two or three hundred years. Other types have suffered in varying degree. We are engaged in studying these various types to learn how they developed and what practices will be conducive of desirable types. A special project on the ecology of aspen supported by contributions from wood-using industries is underway. Included in this is a study of the insects associated with decadence of aspen stands. We have found that Saperda calcarata is very closely identified with this phenomenon and the 59% of the infections by Hypoxyton occur in the egg niches or small larval mines of this species. More than 95% of the Hypoxyton infections occur in insect tunnels. These findings may have an important bearing on the eventual control of Hypoxyton canker and our findings indicate the value that may be expected from closer contacts between forest pathologists and entomologists.

#### Research Underway

White grubs in forest plantations (an ecological study).

Larch Sawfly. Temporarily quiescent awaiting increase in population.

Ecology of susceptible and non-susceptible types.

Aspen insects.

Michigan Department of Conservation

N. F. Smith

We have had an oak wilt aerial survey program in southwestern Michigan for two years. Oak wilt was definitely found in an early stage in three southwest counties in 1951 necessitating a general survey to determine the range of this disease in the State. Thirteen counties were surveyed, picking up thirty-three cases of oak wilt. Survey of twelve additional counties in 1952 added twenty-two more cases. None was found north of Muskegon, Michigan, and the infestation tended to diminish toward the East. We feel that the method of survey has given a forty to fifty per cent coverage. Thus, possibly twice as many cases actually exist.

The University of Michigan, Michigan State College, the State Bureau of Plant Industry, the USDA Forest Insect Laboratory at Milwaukee, and the Department of Conservation all work together on our survey problems. A portion of the information obtained from this insect pest survey is used for research purposes, and more of it eventually will be as it is accumulated over a period of years. We have 560 observation areas on state and private lands; and, in addition, there are others on Federal lands for which we receive reports. In 1952 we received over 1,250 individual reports on these observation areas. These pest surveys have proved extremely useful in our conduct of the forest tent caterpillar program and in setting up a control program for the Saratoga spittlebug.

William Bonifas Lumber Company

L. M. Argetsinger

Kimberly-Clark Corporation either owns or manages rather sizeable tracts of forest land in Ontario and the Lake States. It is the desire of the company to so manage these forest properties or to continuously produce pulpwood and other wood products in the quantity and of the quality which will enable our mills to maintain a favorable position in the highly competitive paper industry. As such, the company attempts to practice the highest standard of forest management which appears to be practical. In the highly technical fields of forest pathology and forest entomology the company has recognized that only through employing the services of men trained in these fields can we hope to keep losses by insects and diseases to a reasonable economic level.

Mr. Donald Prielipp, trained at the University of Minnesota, was told before he began graduate studies that his job would be to determine and recommend methods

of reducing losses to forest diseases in pulpwood forests under management. Applied pathology is no one way street. Assisting in research on Hypoxylon canker, the company has supplied men and equipment to make a field survey of the disease and has established permanent study plots according to the plan set up by Drs. J. R. Hansbrough and Ralph Anderson. Survey and evaluation of butt and top rots in second growth balsam fir in Upper Michigan is a forerunner of an attempt to manage balsam fir in relationship to site and age of stand.

At the University of Michigan, Dr. Sam Graham specifically trained Paul Flink to handle the job of applying entomological knowledge to current pulpwood forest management. A series of permanent plots have been established in poplar stands repeatedly attacked by forest tent caterpillar to determine the insects' effect on stand development. We now are undertaking a survey to determine the yield and quality losses due to insect infestation of spruce and balsam in pulpwood concentration yards. Tests will be undertaken to determine the practicability of controlling these losses.

Kimberly-Clark Corporation is not attempting to do fundamental research, but wants to make use of research to keep technically abreast of the field.

#### Winnipeg Laboratory of Forest Biology

R. R. Lejeune

The Forest Biology Laboratory (Zoology Unit) at Winnipeg is responsible for insect problems in the forested areas of Manitoba and Saskatchewan. The staff consists of ten trained entomologists and biologists, nine rangers, five clerks, stenographers, technicians, etc., plus seasonal help.

Owing to the importance of the larch sawfly problem in Manitoba and Saskatchewan, the laboratory has gradually assumed the major responsibility for larch sawfly research in Canada. Research on many aspects of the problem has been greatly stimulated and aided by the free exchange of information with entomologists in the Lake States. Other insects of current importance in the region covered by the Winnipeg Laboratory are the spruce budworm, jack-pine budworm, forest tent caterpillar, large aspen tortrix, a pine scale - Toumyella Sp., pitch nodule maker, and Hypomolyx piceus.

The following is a list of projects carried out at Winnipeg. Where applicable explanatory comments on status of project, investigator's name, and progress are included.

1. The natural immunity of the larch sawfly to Mesoleius tenthredinis. Project completed. Investigator, J. A. Muldrew. In Manitoba and Saskatchewan (and probably the Lake States and eastern Canada) the larch sawfly has developed an effective immunity to the parasite. This is indicated by an invariably poor hatch of parasite

eggs, which is associated with the formation of phagocytic capsules around the parasite eggs by the host insects. In British Columbia, where a high percentage of parasite eggs hatch, encapsulation rarely occurs.

2. Studies on Bessa harveyi, a parasite of the larch sawfly. In preliminary stages. Investigator, J. A. Muldrew.  
Will deal mainly with population problems.
3. Population studies on the larch sawfly. In progress. Investigator, W. J. Turnock.  
Deals with comparison of population levels, structures, fluctuations, and mortality in tamarack stands on different sites and of various age classes.
4. Nutrition - larch sawfly. In progress. Investigator, R. J. Heron.  
Objects are to determine larval foliage consumption and relate to frass drop, correlate feeding activities to defoliation patterns, and determine extent to which reproductive and survival potentials of sawfly populations are influenced by competition for food.
5. Methods of sampling larch sawfly populations. In progress, report expected during 1953. Investigator, W. G. H. Ives.  
Objects are to develop a statistically reliable and rapid egg sampling technique to estimate potential field populations, and to relate egg counts to subsequent survival.
6. Small mammal predators of the larch sawfly. In progress. Investigator, C. H. Buckner.  
It has been found that four species of small mammals are important larch sawfly predators and two species are of minor importance out of 14 species observed or captured in tamarack bogs. The relative abundance of important species varies widely with the habitat. Quantitative data on amount of predation will be gathered in 1953.
7. Studies on growth and management of tamarack in relation to the larch sawfly. In progress. Investigator, G. V. Shearsmith.  
Deals mainly with effect of defoliation on tamarack growth and a study of patterns of past outbreaks.
8. Influence of soil moisture on larch sawfly populations. Completed.  
Overwintered cocoons in diapause may be killed by immersion in water for four to six weeks. Post-diapause stages in cocoons are highly susceptible to immersion. Newly-spun cocoons less than two weeks old are also highly susceptible. Resistance to flooding is correlated with rate of oxygen consumption.

9. Biology of Hypomolyx piceus and its relation to root-rot in white spruce. Completed. Report expected in 1953. Investigator, G. L. Warren, in co-operation with Forest Pathology, Saskatoon, Saskatchewan. Life history and description of stages, nature of injury, type and age of trees attacked, and preferred sites have been determined.
10. Stand openings caused by dying trees in spruce stands. New project for 1953. Investigators, G. L. Warren, in co-operation with R. Whitney and H. Van Groenwoud, Forest Pathology, Saskatoon, Saskatchewan. Entomological aspect will deal with H. piceus relationship to the problem.
11. Life history and ecology of the pitch nodule maker, Petrova albicapitana. Completed, article in press "Canadian Entomologist". Investigator, W. J. Turnock.
12. The identification and study of mature and immature forms of sawflies. Continuing project. Investigator, H. R. Wong.
13. The life history and some aspects of the ecology of the large aspen tortrix, Archips conflictana. In progress, report expected in 1953. Investigator, R. M. Prentice.
14. Nutrition - jack-pine budworm. In progress. Investigator, R. J. Heron. Objects are to compare carbon-nitrogen ratios on flowering and non-flowering jack-pine, to determine if foliage with various C-N ratios differs in nutritional value for jack-pine budworm larvae, and to compare such physiological values as survival, rate of development, fecundity, etc., for larvae fed on foliage and male flowers.

University of Minnesota

D. W. French

A. Oak wilt.

1. Movement of oak wilt other than through root grafts.
  - a. Transmission on pruning equipment.
  - b. Entry through wounds made at different times of the year.
  - c. Transmission on or in squirrels.
  - d. Movement through soil distinct from movement within joined root systems.
  - e. Dissemination by means of wind and rain.

2. Control of oak wilt.
  - a. Tests to stop or limit oak wilt, in stands where wilt is already well established.
  - b. Control in burr oak by pruning out infected portions of the tree.
3. Miscellaneous subjects.
  - a. Whether there are parasitic races of Endoconidiophora fagacearum.
  - b. A specific medium for the oak wilt fungus.
  - c. Toxins produced by this fungus (Hormel Institute project).
  - d. Reproduction in oak wilt infected stands.
  - e. Distribution of compatibility groups A and B and the conditions required for their crossing.
- B. Wetwood (In cooperation with the Department of Forestry).
  1. Isolation from a range of species that have wetwood.
  2. Inoculation of these isolates into various species to check pathogenicity.
  3. Survey for wetwood in natural stands, and in individual trees.
  4. Epidemiology of the disease.
  5. Effect on mechanical and physical properties of the infected wood.
- C. Dissemination of wood decay fungi.
  1. Movement of inoculum throughout the year.
  2. Agents of dissemination.
  3. Comparison of wind dissemination with other possible modes, such as rodents and insects.
- D. Miscellaneous projects.
  1. Survey for cause of elm wilt in Minnesota; this is a check for Dutch elm disease and phloem necrosis.
  2. Microbiology of conifer seed (inactive at present).
  3. Biological aspects of insulation board.

4. Effect of minor insects and leaf diseases on tree growth and general tree health (in cooperation with State Entomologist Office).
5. Selection of desirable elms and poplars (in cooperation with the Department of Forestry).
6. Hypoxylon canker (in cooperation with Dr. Anderson, USDA).
7. Mistletoe on black spruce (in cooperation with Dr. Anderson, USDA).
8. White pine blister rust parasitic race study (in cooperation with Dr. Anderson, USDA).

University of Minnesota

A. C. Hodson

Most of the research on forest insect problems has been carried on through cooperative efforts of the University, the Office of the State Entomologist, the State Forest Service and the Federal Bureau of Entomology and Plant Quarantine. Generous assistance has been provided by the Federal Forest Service. The projects on which the main effort has been placed during the past few years are summarized briefly in the following statements.

1. Plantation problems - Individual trees in several plantations have been examined annually to determine the kind and amount of damage that they may have suffered. At the Cloquet Forest Experiment Station over 9,000 trees have been examined critically each year over a ten year period. The growth form and survival of the trees can be related to the historical picture of insect infestation afforded by this detailed survey.
2. The northern walkingstick - This insect, which has been present in outbreak numbers in the State since 1941, has been investigated in a number of ways. Several tests to determine the best methods for chemical control have been tried with both ground and aerial equipment. Population dynamics, including studies of dispersal, host selection, natural mortality, etc., have been given the greatest amount of attention. A bioclimatic study of the distribution and abundance of the northern walkingstick has been particularly fruitful.
3. The forest tent caterpillar - With the forest tent caterpillar in one of its periodic outbreak stages it has been studied intensively for the past three years. Control by standard recommendations for the application of DDT by air and the testing of new insecticides have been included in the investigation. Much of the biological research has been centered on the problem of natural control, the relation between population density and oviposition, and survey methods.

4. The larch sawfly - Both biological and control investigations have been made on the current outbreak population of the larch sawfly. The problem of timing air applications of insecticides has been one of the most important and at the same time one of the most vexing aspects of this investigation.
5. An annual forest insect survey has been conducted. This survey has now been in continuous operation since 1939.
6. A number of projects involving studies of the larch sawfly, the red-headed pine sawfly, the introduced pine sawfly, the shoot moth, Eucosma sonomana, and the pine pitch nodule-maker have been developed by graduate students for degrees at the University.

#### Lake States Forest Experiment Station

##### R. L. Anderson

Most of the Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering research in the Lake States Region has been concentrated in a study of the Hypoxylon canker of aspen problem. A number of pulp and paper companies have taken an active part in this work. Two hundred and eleven, one-tenth acre plots were established in aspen stands in an effort to determine the relationship, if any, between site, stand and tree characteristics and prevalence of infection. Individual tree records were obtained on over 19,000 living and 10,000 dead aspen. No correlations were found between tree characteristics, site index, or any of the factors analyzed which have a bearing on site quality, and the prevalence of canker. Marked variations in prevalence of infection from area to area in the region were noted along with reduced prevalence in older stands. There is a strong probability that low stand density and stem exposure may cause increased prevalence of infection. A number of permanent plots have been established for long time study of the problem and thinning plots are being established to evaluate the effects of thinning on canker prevalence.

A study is being conducted at the Dukes Experimental Forest to determine the relationship between various types of injuries caused by partial cutting in hard maple stands at a known time in the past and the consequent amount of decay and degrade. Efforts are also being made to determine the important wood decay fungi involved.

A study is being made to determine whether or not there are races of the white pine blister rust fungus. This problem has an important bearing on the breeding of white pine resistant to the disease, as new or different races of the fungus might be able to infect previously resistant strains of pine. To date the results are inconclusive.



A serious root rot of white pine in the Chittenden Nursery at Wellston, Michigan, is being studied. A number of tests employing a variety of fungicides, insecticides, and fumigants have not given control. Further studies are being made to determine what is responsible for the root rot.

Indian Head Laboratory of Forest Biology

L. O. T. Peterson

The geographical region served by the Forest Biology Laboratory at Indian Head, Saskatchewan, is composed of the Agricultural areas of Manitoba, Saskatchewan, and Alberta. In general, the southern and western portions of this region are prairie, the northern and eastern portions are park belt.

Trees for planting on farms in this agricultural region have been distributed annually since 1901 by the Federal government. In 1952, the annual distribution was seven million deciduous trees to 5,180 farms, and almost 300,000 conifers to two thousand farms. The total distribution from 1901 to 1952 is 236 million deciduous trees and six million conifers to approximately 100,000 farms. The principal species of trees distributed are box elder, American elm, green ash, poplars, willows, caragana, white spruce, Colorado spruce, Scots pine.

The laboratory at Indian Head, Saskatchewan, was established in 1924 to cope with insect problems occurring in farm plantings and in natural stands on agricultural and non-agricultural lands in the Prairie Provinces. The region was later reduced to its present size by excluding non-agricultural lands. The problems were thus limited to investigations of insects and related pests affecting farm shelter belts, ornamental plantings, and natural stands on farm lands.

Up to 1939, research included preliminary studies on the forest tent caterpillar and fall cankerworm, and somewhat more detailed studies on the spruce spider mite, pine needle scale, prairie willow leaf beetle, poplar borer, box elder twig borer, box elder leaf roller. For several of these, applied control measures were investigated. Extension became an important function during this period.

In 1940, the forest insect survey was initiated in the laboratory region. Until the end of World War II, coverage of the region was dependent on the cooperation of the provincial agricultural extension services in Manitoba, Saskatchewan, and Alberta, and on other cooperating agencies. During the war period, the reduced laboratory staff was chiefly occupied with extension and the organizing and directing of annual campaigns to control the fall cankerworm and cecropia moth on box elder and elm, and, the yellow headed-spruce sawfly on spruce, in farm shelter belts and in urban plantings. Research was limited to field studies of the poplar borer, and to field and insectary studies of the cecropia moth.

Following World War II, the laboratory staff, facilities, and program were expanded. Forest insect rangers undertook the field work of the forest insect survey and more reliable information on tree insects was obtained. In research, detailed studies on the fall cankerworm, yellow-headed spruce sawfly, pine needle scale, and caragana seed chalcid were carried out. The caragana seed chalcid proved to be a new species of Eurytoma, as yet unnamed. Its larvae live in the seeds of caragana. This insect was important because it interfered with a caragana breeding program undertaken by the Forest Nursery Station at Indian Head. These studies also included applied control using the newer synthetic pesticides.

Recently, the functions of the laboratory have been re-defined and the laboratory program changed to include more biological research. Extension work is being greatly reduced, and also the routine testing of pesticides. The forest insect survey is less a detection service and more a research tool. Its activities are centred around insect species of major importance to trees in the region, and the supporting of the various research projects undertaken, including studies of tree diseases. Research projects in progress are taxonomic and field studies of aphids affecting trees, and investigation of tree seed insects. An investigation of the progeny of mated and unmated females of the pine needle scale has just been concluded. Researches planned are population studies of the fall cankerworm, and a study of the forest tent caterpillar during its current invasion of the agricultural region.

#### Laboratory Program - 1953

##### Projects and Project Leaders.

1. Forest insect and disease survey - C. E. Brown.
2. Taxonomic and field studies of aphids affecting trees - G. A. Bradley.
3. Investigation of tree seed insects - A. F. Hedlin.  
(currently of spruce and pines)
4. Investigation of population fluctuation in the fall cankerworm -  
C. E. Brown.
5. The forest tent caterpillar - Margaret E. P. Cumming.

#### University of Wisconsin

##### James E. Kuntz

##### Project Outline

Forestry at the University of Wisconsin is perhaps unique in that we have no undergraduate forestry school as such, but rather a group of scientists from

different departments actively engaged in various phases of forestry research. A number of research assistants participate in these projects while continuing graduate study leading to higher degrees.

At present, forestry research at the University includes problems in forest soils (S. A. Wilde and G. K. Voigt), forest entomology (R. D. Shenefelt and E. W. King), forest genetics (R. A. Brink and R. G. Hitt), and forest pathology (A. J. Riker, J. E. Kuntz, and R. F. Patton). Other departments contribute much to these studies. The Wisconsin Conservation Department, in cooperation with the United States Department of Agriculture, the Wisconsin Department of Agriculture, several wood-using industries, and other agencies assist and support these investigations.

#### Research on Diseases of Forest Trees Includes the Following Projects

1. White Pine Blister Rust (R. F. Patton, A. J. Riker, and E. P. Van Arsdel). The purpose of this program is to select or synthesize blister-rust resistant white pines of good form, rapid growth, and superior timber type. Selection of rust-free white pines from widely scattered areas of severe natural infection have been evaluated both in a disease nursery and in field plantings. Methods of propagating resistant clones by grafts and cuttings are being devised. Since progeny from these open-pollinated resistant trees has shown low percentage of resistant individuals, possibilities of synthesizing resistant hybrids through controlled pollinations and the pattern of this inheritance are being studied. The eventual establishment of plantations of resistant trees as a source of resistant seed is a major goal.

Correlation of local meteorological conditions with blister rust infection, especially in southwestern Wisconsin where natural incidence is spotty, indicates modifications in local Ribes eradication programs and in recommendations for plantings.

2. Oak Wilt Spread and Control (J. E. Kuntz, A. J. Riker, and C. H. Beckman). Major emphasis has been given to the manner of local spread and to methods for its control. The progressive, tree-to-tree spread of oak wilt through extensive, natural, underground root grafts has been demonstrated. The role of such root grafting among several forest trees has been studied by means of dyes, poisons, and radioactive isotopes. Several "adopted" root systems have been found. Severing these connecting "pipelines" either mechanically (trenching, root cutter, ditch digger, etc.) or chemically (a barrier of poisoned trees) has prevented further local spread.

Factors affecting host-parasite relationships and disease development have been investigated. Rapid plugging of the vascular system of an infected tree with tyloses and gums as much as 4 days before leaf wilting appears may contribute to symptom development and death of the tree.

Woodpecker drilling and squirrel gnawing have been found closely associated with fungus sporulation beneath the loosening bark of wilt-killed trees. However, means of long-distant spread remains unknown.

3. Poplar Improvement and Disease Resistance (K. R. Shea, J. E. Kuntz, and A. J. Riker). Productivity of our native aspen is seriously limited by disease--especially by Hypoxylon canker. Improvement of existing stands appears limited. Despite these difficulties, poplars are still among our fastest-growing trees, are easily propagated, readily hybridized, and have an increasing variety of uses. Hybrids produced elsewhere, although fast growing and of established quality, have proved unsuitable in Wisconsin for various reasons.

This selection, propagation, and hybridization of superior native poplars already growing under Wisconsin conditions have demonstrated differentials in rooting ability, growth rate, and disease and insect resistance. Improved techniques for hybridization, propagation, and culture have been devised. Seed viability was maintained in storage at low temperatures and moderate humidities. Damping-off was controlled by soil and seed treatment.

The incidence and development of Hypoxylon canker studied in 67 forest plots in central and northern Wisconsin demonstrated fungus entry through various resistance of cottonwoods and their hybrids as compared to aspen.

4. Damping-off of Coniferous Seedlings (J. G. Berbee and A. J. Riker). Damping-off, though sporadic, is a serious problem in Wisconsin nurseries. Present investigations include further clarification of the soil and climatic conditions under which the various damping-off organisms operate together through practical control with newer fungicides.
5. Chemical Herbicides in Forest Practice (J. E. Kuntz and A. J. Riker). Studies involving the use of chemical herbicides include; (1) weed control in forest fire lanes and access roads, (2) reduction of seed competition in forest plantings, (3) weed control in forest nurseries, and (4) the eradication of undesirable trees, especially as it applies to the control of oak wilt.
6. Other projects include studies of physiological needle droop of red pine; root rot of conifers, especially in plantations; resistance to cedar apple rust; and the control of cedar blight.

University of WisconsinR. D. Shenefelt

In Wisconsin research on forest insects is conducted at the University and largely supported by funds from the Wisconsin Conservation Department. Detection survey, appraisal survey, and control are carried on by the Conservation Department in co-operation with the State Department of Agriculture.

One of our research projects is concerned with the spread of oak wilt by insect vectors. All results to date have been negative. We also have a number of problems in connection with nurseries, including a white grub problem. We have obtained excellent control of white grubs with a number of the newer insecticides, and are now attempting to determine the amount of chemical residues left in the soil after varying periods of time. Another project, which deals with the effects of insects and their control in pulpwood, is supported by the Nekoosa-Edwards Paper Company. This project has been going on for four years now. We have nearly finished a study on jack pine and have started a similar one on poplar. We follow the pulp logs from the time they are cut through the making of paper and its tests. We have started some long-range projects on the composition of certain forest types in relation to forest insect outbreaks and are studying the long-range effect of forest insect outbreaks in cooperation with the Northern Lakes Research Center of the United States Forest Service. We would like to start a project on biological control of forest insects in co-operation with Dr. MacAloney and his group at Milwaukee, Wisconsin. This is an extremely brief summary of the work we have underway at the University.

Forest Pathology in OntarioL. T. White

The universities in Ontario undertake a number of special problems in forest pathology. Some of these are supported by grants in aid from the Ontario Research Council. Studies of developmental plant physiology, mycorrhiza, and tree growth in relation to respiration are undertaken by Dr. C. H. Duff, of the University of Toronto. The Ontario Research Council also supports Dr. Carl Heimburger's studies of forest genetics in the development of disease-resistant trees. At Queen's University, Dr. H. M. Good is conducting histological and anatomical studies in relation to infection of wounds by decay fungi; and studies of changing substances in the succession of fungus attack. Dr. Chase, of the Ontario Agricultural College, Guelph, Ontario, is to undertake studies of the microbiology of forest soils. The first problem may relate to the fixation of nitrogen in certain acid forest soils. These studies will be closely integrated with the soil site evaluations of Mr. Angus Hills. In Ontario, research in forest pathology is mainly the responsibility of the Laboratory of Forest Pathology at Toronto. This laboratory came into being in 1947 and since then has worked in close cooperation with provincial forest authorities. The work is undertaken under the terms of a federal-provincial contract. This contract provides for the construction of a modern

and well equipped laboratory at the Southern Experimental Station, Maple, Ontario. This laboratory is being built and will be maintained by the Province and staffed and administered by the Canadian government. It should be completed and occupied by mid-summer of 1953. The relationship of our two disciplines is very close. The forest pathology programme is integrated with the general programme of forestry research conducted under the Provincial Department of Lands and Forests. Within this programme are the following:

Disease Survey Dr. Quirke is charged with the conduct of this survey in Ontario. The survey operates in cooperation with the Forest Insect Survey and employs the same staff. Approximately 5,000 disease samples were processed during 1952, the second year of survey activity within this scheme.

Physiological Diseases Physiological diseases provide a number of major projects at the Toronto laboratory. Included here are the abnormal condition of yellow birch and the needle blight of white pine. Some 3,500 yellow and white birch trees in 35 sample plots are under continuous observation. There is evidence that the rate of deterioration in Ontario has been retarded and that increasing numbers of trees in vigorous age classes are showing improvement in their crown condition. Recently, efforts have been directed towards a study of root systems of yellow birch, particularly in relation to the occurrence of dead root tips and of mycorrhizal formations on healthy roots. Dr. V. Slankis, an expert on mycorrhiza, has been employed to undertake these and other related studies. It is indicated that a correlation exists between these occurrences and the "deterioration" symptoms present in the tree crown. Similar relationships have been found in the roots of residual yellow birch trees in the Maritimes by Mr. D. R. Redmond. Mycorrhizal development and its relation to temperature, soil site conditions, and to other soil inhabiting organisms is a major concern in our attempt to discover the cause of the abnormal condition of birch in Ontario. Similar studies of roots of white pine may assist in defining the cause of white pine needle blight.

The alleged injury to forest stands by sulphur fumes emanating from the stacks of large smelters in the Sudbury area is under study by the Toronto laboratory.

Nursery Diseases Damping-off of red pine seedlings is a serious problem in our forest nurseries. Unlike the pattern in other areas the principal causal organisms encountered are Fusaria. Experiments are conducted using peat moss, acidifying chemicals and other soil amendments with varying degrees of success.

Introduced Diseases A number of introduced diseases are causing concern. Among these is the white pine blister rust. Our present effort includes surveys and assessments, studies of infection courts, and studies of silvicultural control. The Dutch elm disease is now established in Ontario and undoubtedly will require attention directed towards selection of resistant elms and general sanitation.

Silvicultural Studies Silvicultural studies have been undertaken by this laboratory. There has been considerable work in determining decay losses existing in different aged stands of white pine, balsam, poplar, spruce, sugar maple, and others. These studies were designed to provide information required in the construction of forest inventories and management plans. Studies of the break-up and replacement of stands following fires and severe insect depredations are being conducted..

Mycological Studies A number of fundamental mycological studies derived from diseased material received in the forest disease survey are proceeding. We have assigned an officer to undertake work concerning pathological aspects of Dr. Heimbürger's forest tree breeding programme.

CENTRAL INTERNATIONAL FOREST INSECT AND DISEASE CONFERENCE  
STATEMENT OF OBJECTIVES

Purpose:

To make possible the free and informal exchange of forest insect and disease information between interested personnel in the Lake States and the Central Provinces of Canada.

Officers:

Only one officer, a chairman, will be elected. His term in office shall begin with the close of the annual meeting at which he was elected and shall terminate with the election of his successor.

The chairman shall be responsible for:

- (a) Arrangements for the annual meeting. He may call on representatives from the States and Provinces for assistance as required.
- (b) He shall compile and distribute agenda for the annual meeting.
- (c) He shall preside over the annual meeting.

Meetings:

- (a) One annual meeting shall be held alternately north and south of the international boundary if possible.
- (b) The only record of the annual meeting need be a mailing list.



ATTENDANCE AT JANUARY 6 AND 7, 1953  
CENTRAL INTERNATIONAL FOREST INSECT AND DISEASE CONFERENCE

<u>Name</u>	<u>Address</u>	<u>Affiliation</u>
Aamodt, T. L.	University Farm, St. Paul, Minnesota	State Entomologist
Aamodt, T. T.	University Farm, St. Paul, Minnesota	State Entomologist
Anderson, R.	University Farm, St. Paul, Minnesota	USDA Forest Pathologist
Argetsinger, L. M.	Neenah, Wisconsin	Kimberly Clark
Atwood, C. A.	Toronto, Ontario	University of Toronto
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Butcher, J. W.	University Farm, St. Paul, Minnesota	State Entomologist
Buzicky, A. W.	University Farm, St. Paul, Minnesota	State Entomologist
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